WHAT IS CLAIMED IS:

1. A phase-changeable memory device, comprising:

a phase-changeable material pattern of a phase-changeable material that includes nitrogen atoms; and

first and second electrodes electrically connected to the phase-changeable material pattern and provide an electrical signal thereto.

2. The device of Claim 1, wherein the phase-changeable material pattern has a polycrystalline structure.

3. The device of Claim 1, wherein an amount of the nitrogen atoms included in the phase-changeable material is from about 0.25% to about 25% with respect to the total atomic weight of ingredients of the phase-changeable material.

4. The device of Claim 1, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-Te-N, Ag-In-Sb-Te-N, 5A group element-Sb-Te-N, 6A group element-Sb-Te-N, 5A group element-Sb-Se-N, and/or 6A group element-Sb-Se-N.

5. The device of Claim 1, wherein the first and second electrodes comprise a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide and/or a combination thereof.

6. The device of Claim 5, wherein the first and/or second conductive electrodes further include one of aluminum (Al), aluminum-copper alloy (Al-Cu), aluminum-copper-silicon alloy (Al-Cu-Si), tungsten silicide (WSi), copper (Cu), tungsten titanium (TiW) and/or a combination thereof.

7. The device of Claim 5, wherein the conductive material containing nitrogen comprises titanium nitride (TiN), tantalum nitride (TaN), molybdenum nitride (MoN), niobium nitride (NbN), titanium silicon nitride (TiSiN), titanium aluminum nitride (TiAlN), titanium boron nitride (TiBN), zirconium silicon nitride (ZrSiN), tungsten silicon nitride (WSiN), tungsten boron nitride (WBN), zirconium

aluminum nitride (ZrAlN), molybdenum silicon nitride (MoSiN), molybdenum aluminum nitride (MoAlN), tantalum silicon nitride (TaSiN), tantalum aluminum nitride (TaAlN), titanium oxide nitride (TiON), titanium aluminum oxide nitride (TiAlON), tungsten oxide nitride (WON) and/or tantalum oxide nitride (TaON).

8. The device of Claim 1, further comprising:

a transistor including a source region, a drain region and a gate electrode;

a lower interconnection electrically connected to the drain region; and

an upper metal interconnection electrically connected to one of the first and second electrodes;

wherein the other of the first and second electrodes is electrically connected to the source region.

9. A phase-changeable memory device, comprising:

a phase-changeable material pattern of a phase-changeable material having a polycrystalline structure; and

first and second electrodes electrically connected to the phase-changeable material pattern to provide an electrical signal thereto.

10. The device of Claim 9, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-Te-N, Ag-In-Sb-Te-N, a 5A group element-Sb-Te-N, a 6A group element-Sb-Te-N, a 5A group element-Sb-Se-N, and/or a 6A group element-Sb-Se-N.

11. The device of Claim 10, wherein an amount of nitrogen atoms in the phase-changeable material pattern is from about 0.25% to about 25% with respect to the total atomic weight of ingredients of the phase-changeable material.

12. A phase-changeable memory device, comprising:

a transistor including a source region, a drain region and a gate electrode disposed on the semiconductor substrate;

a lower interconnection electrically connected to the drain region;

a contact pad formed of the same material and placed on the same height as the lower interconnection;

a variable resistor electrically connected to the contact pad; and

an upper interconnection electrically connected to the variable resistor,

wherein the variable resistor is interposed between the two electrodes and includes nitrogen atoms.

13. The device of Claim 12, wherein the variable resistor includes a phase-changeable material pattern having a polycrystalline structure.

14. The device of Claim 13, wherein the variable resistor includes a phase-changeable material pattern that includes nitrogen atoms, wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to the total atomic weight of ingredients of the phase-changeable material.

15. The device of Claim 12, wherein the variable resistor includes a phase-changeable material pattern that includes nitrogen atoms, wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to the total atomic weight of ingredients of the phase-changeable material.

16. The device of Claim 12, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-Te-N, Ag-In-Sb-Te-N, a 5A group element-Sb-Te-N, a 6A group element-Sb-Te-N, a 5A group element-Sb-Se-N, and/or a 6A group element-Sb-Se-N.

17. The device of Claim 12, wherein the first and second electrodes comprise a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide and/or a combination thereof.

18. The device of Claim 15, wherein the two electrodes comprise a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide, and/or a combination thereof.

19. The device of claim 17, wherein one of the two electrodes is

electrically connected to the contact pad and the other electrode is electrode is electrically connected to the upper interconnection,

wherein the other electrode connected to the top electrode further comprises aluminum (Al), aluminum-copper alloy (Al-Cu), aluminum-copper-silicon alloy (Al-Cu-Si), tungsten silicide (WSi), copper (Cu), tungsten titanium (TiW), and/or a combination thereof.

20. The device of claim 19, wherein the conductive material containing nitrogen comprises titanium nitride (TiN), tantalum nitride (TaN), molybdenum nitride (MoN), niobium nitride (NbN), titanium silicon nitride (TiSiN), titanium aluminum nitride (TiAlN), titanium boron nitride (TiBN), zirconium silicon nitride (ZrSiN), tungsten silicon nitride (WSiN), tungsten boron nitride (WBN), silicon aluminum nitride (ZrAlN), molybdenum silicon nitride (MoSiN), molybdenum aluminum nitride (MoAlN), tantalum silicon nitride (TaSiN), tantalum aluminum nitride (TaAlN), titanium oxide nitride (TiON), titanium aluminum oxide nitride (TiAlON), tungsten oxide nitride (WON) and/or tantalum oxide nitride (TaON).

21. A phase-changeable memory device comprising:

a transistor including a source region, a drain region and a gate electrode that are disposed on the semiconductor substrate;

an interlayer dielectric layer formed on the semiconductor substrate to cover the transistor;

a lower interconnection disposed in the interlayer dielectric layer to connect to the drain region electrically;

a contact pad disposed in the interlayer dielectric layer at substantially the same height and formed of the same material as the lower interconnection;

a lower intermetal dielectric layer disposed on the interlayer dielectric layer;

a variable resistor electrically connected to the contact pad;

an upper intermetal dielectric layer disposed on the lower intermetal dielectric layer to cover a side of the variable resistor; and

an upper interconnection disposed in the upper intermetal dielectric layer to connect to the variable resistor electrically,

wherein the variable resistor comprises:

a bottom electrode penetrating a portion of the lower intermetal dielectric

layer to electrically connect to the contact pad;

a phase-changeable material pattern containing nitrogen atoms disposed on the lower intermetal dielectric layer and on the bottom electrode ; and

a top electrode disposed on the phase-changeable material pattern to electrically connect to the upper interconnection.

22. The device of Claim 21, wherein the phase-changeable material pattern has a polycrystalline structure.

23. The device of claim 22, wherein an amount of the nitrogen atoms is about from 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material pattern.

24. The device of Claim 23, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-Te-N, Ag-In-Sb-Te-N, a 5A group element-Sb-Te-N, a 6A group element-Sb-Te-N, a 5A group element-Sb-Se-N, and/or a 6A group element-Sb-Se-N.

25. The device of Claim 24, wherein the bottom and top electrodes comprise a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide, and/or a combination thereof.

26. The device of Claim 25, wherein a top surface of the top electrode is lower than a top surface of the upper intermetal dielectric layer, and

further comprising a conductive plug penetrating the intermetal dielectric layer on the top electrode to electrically connect to the upper interconnection,

wherein a diameter of the conductive plug is smaller than a width of the top electrode and the conductive plug comprises aluminum (Al), aluminum-copper alloy (Al-Cu), aluminum-copper-silicon alloy (Al-Cu-Si), tungsten silicide (WSi), copper (Cu), tungsten titanium (TiW), and/or a combination thereof.

27. The device of Claim 26, wherein the conductive material containing nitrogen comprises titanium nitride (TiN), tantalum nitride (TaN), molybdenum

nitride (MoN), niobium nitride (NbN), titanium silicon nitride (TiSiN), titanium aluminum nitride (TiAlN), titanium boron nitride (TiBN), zirconium silicon nitride (ZrSiN), tungsten silicon nitride (WSiN), tungsten boron nitride (WBN), silicon aluminum nitride (ZrAlN), molybdenum silicon nitride (MoSiN), molybdenum aluminum nitride (MoAlN), tantalum silicon nitride (TaSiN), tantalum aluminum nitride (TaAlN), titanium oxide nitride (TiON), titanium aluminum oxide nitride (TiAlON), tungsten oxide nitride (WON) and/or tantalum oxide nitride (TaON).

28. A method of forming a phase-changeable memory device, comprising:

forming a first electrode on a semiconductor substrate;

forming a phase-changeable material pattern containing nitrogen atoms to be in contact with the first electrode; and

forming a second electrode on the phase-changeable material pattern.

29. The method of Claim 28, wherein the phase-changeable material pattern is formed by a sputtering method in the temperature range of from about 100°C to about 350°C, targeting chalcogenide compounds, using argon gas as a transfer gas and nitrogen gas as a source of nitrogen atoms.

30. The method of Claim 29, wherein the chalcogenide compound comprises Ge-Sb-Te, As-Sb-Te, As-Ge-Sb-Te, Sn-Sb-Te, In-Sn-Sb-Te, Ag-In-Sb-Te, a 5A group element-Sb-Te, a 6A group element-Sb-Te, a 5A group element-Sb-Se, and/or a 6A group element-Sb-Se.

31. The method of Claim 28, wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material pattern.

32. The method of Claim 30, wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material pattern.

33. The method of Claim 28, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-

Te-N, Ag-In-Sb-Te-N, a 5A group element-Sb-Te-N, a 6A group element-Sb-Te-N, a 5A group element-Sb-Se-N, and/or a 6A group element-Sb-Se-N.

34. The method of Claim 28, wherein the first and second electrodes comprise a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide, and/or a combination thereof.

35. The method of Claim 34, wherein the conductive material containing nitrogen comprises titanium nitride (TiN), tantalum nitride (TaN), molybdenum nitride (MoN), niobium nitride (NbN), titanium silicon nitride (TiSiN), titanium aluminum nitride (TiAlN), titanium boron nitride (TiBN), zirconium silicon nitride (ZrSiN), tungsten silicon nitride (WSiN), tungsten boron nitride (WBN), silicon aluminum nitride (ZrAlN), molybdenum silicon nitride (MoSiN), molybdenum aluminum nitride (MoAlN), tantalum silicon nitride (TaSiN), tantalum aluminum nitride (TaAlN), titanium oxide nitride (TiON), titanium aluminum oxide nitride (TiAlON), tungsten oxide nitride (WON) and/or tantalum oxide nitride (TaON).

36. A method of forming a phase-changeable memory device, comprising:

providing a semiconductor substrate including an interlayer dielectric layer;

forming a lower intermetal dielectric layer on the interlayer dielectric layer;

forming a first electrode penetrating the lower intermetal dielectric layer;

sequentially forming a phase-changeable material pattern and a second electrode on the first electrode and the lower intermetal dielectric layer; and

forming an upper intermetal dielectric layer on the lower intermetal dielectric layer to cover the phase-changeable material pattern and the second electrode,

wherein the phase-changeable material pattern comprises a phase-changeable material containing nitrogen atoms with polycrystalline structure

37. The method of Claim 36, wherein sequentially forming the phase-changeable material pattern and the second electrode, comprises:

forming a phase-changeable material layer containing nitrogen atoms with a polycrystalline state on the first electrode and the lower intermetal dielectric layer;

forming a second electrode layer on the phase-changeable material layer; and

successively patterning the second electrode layer and the phase-changeable material layer to be electrically connected to the first electrode.

38. The method of Claim 37, wherein the phase-changeable material layer is formed by a sputtering method in the temperature range of from about 100°C to about 350°C, targeting chalcogenide compounds, using argon gas as a transfer gas and nitrogen gas as a source of nitrogen atoms.

39. The method of Claim 38, wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material layer.

40. The method of Claim 39, wherein the chalcogenide compound comprises Ge-Sb-Te, As-Sb-Te, As-Ge-Sb-Te, Sn-Sb-Te, In-Sn-Sb-Te, Ag-In-Sb-Te, a 5A group element-Sb-Te, a 6A group element-Sb-Te, a 5A group element-Sb-Se, and/or a 6A group element-Sb-Se.

41. The method of Claim 36, wherein providing a semiconductor substrate including an interlayer dielectric layer, comprises:

forming a transistor including a source region, a drain region and a gate electrode on the semiconductor substrate;

forming the interlayer dielectric layer on the semiconductor substrate to cover the transistor;

patterning the interlayer dielectric layer to form openings exposing the source and drain regions; and

forming a contact pad and a lower interconnection electrically connected the source and drain regions, respectively by filling the openings with conductive materials,

wherein the first electrode is electrically connected to the contact pad.

42. The method of Claim 36, further comprising:

etching the upper intermetal dielectric layer to planarize the intermetal dielectric layer and expose the top electrode;

forming an interconnection material on the planarized intermetal dielectric

and the top electrode; and

patterning the interconnection material to form an upper interconnection electrically connected to the top electrode.

43. The method of Claim 41, further comprising:

etching the upper intermetal dielectric layer to planarize the intermetal dielectric layer and expose the top electrode;

forming an interconnection material on the planarized intermetal dielectric and the top electrode; and

patterning the interconnection material to form an upper interconnection electrically connected to the top electrode.

44. The method of Claim 36, further comprising:

patterning the upper intermetal dielectric layer to form an opening exposing a portion of the top electrode;

forming a conductive plug filling the opening;

forming an interconnection material on the upper intermetal dielectric layer and the conductive plug; and

patterning the interconnection material to form an upper interconnection electrically connected to the conductive plug.

45. The method of Claim 41, further comprising:

patterning the upper intermetal dielectric layer to form an opening exposing a portion of the top electrode;

forming a conductive plug filling the opening;

forming an interconnection material on the upper intermetal dielectric layer and the conductive plug; and

patterning the interconnection material to form an upper interconnection electrically connected to the conductive plug.

46. A method of forming a phase-changeable device, comprising:

forming a first electrode on a semiconductor substrate;

forming a phase-changeable material pattern with a polycrystalline structure having 100nm grains or smaller; and

forming a second electrode on the phase-changeable material pattern.

47. The method of Claim 46, wherein the phase-changeable material pattern is formed by a sputtering method targeting chalcogenide compounds, using argon gas as a transfer gas and nitrogen gas.

48. The method of claim 46, wherein the phase-changeable material pattern comprises Ge-Sb-Te-N, As-Sb-Te-N, As-Ge-Sb-Te-N, Sn-Sb-Te-N, In-Sn-Sb-Te-N, Ag-In-Sb-Te-N, a 5A group element-Sb-Te-N, a 6A group element-Sb-Te-N, a 5A group element-Sb-Se-N, and a 6A group element-Sb-Se-N.

49. The method of Claim 47 wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material layer.

50. The method of Claim 48 wherein an amount of the nitrogen atoms is from about 0.25% to about 25% with respect to a total atomic weight of ingredients of the phase-changeable material layer.